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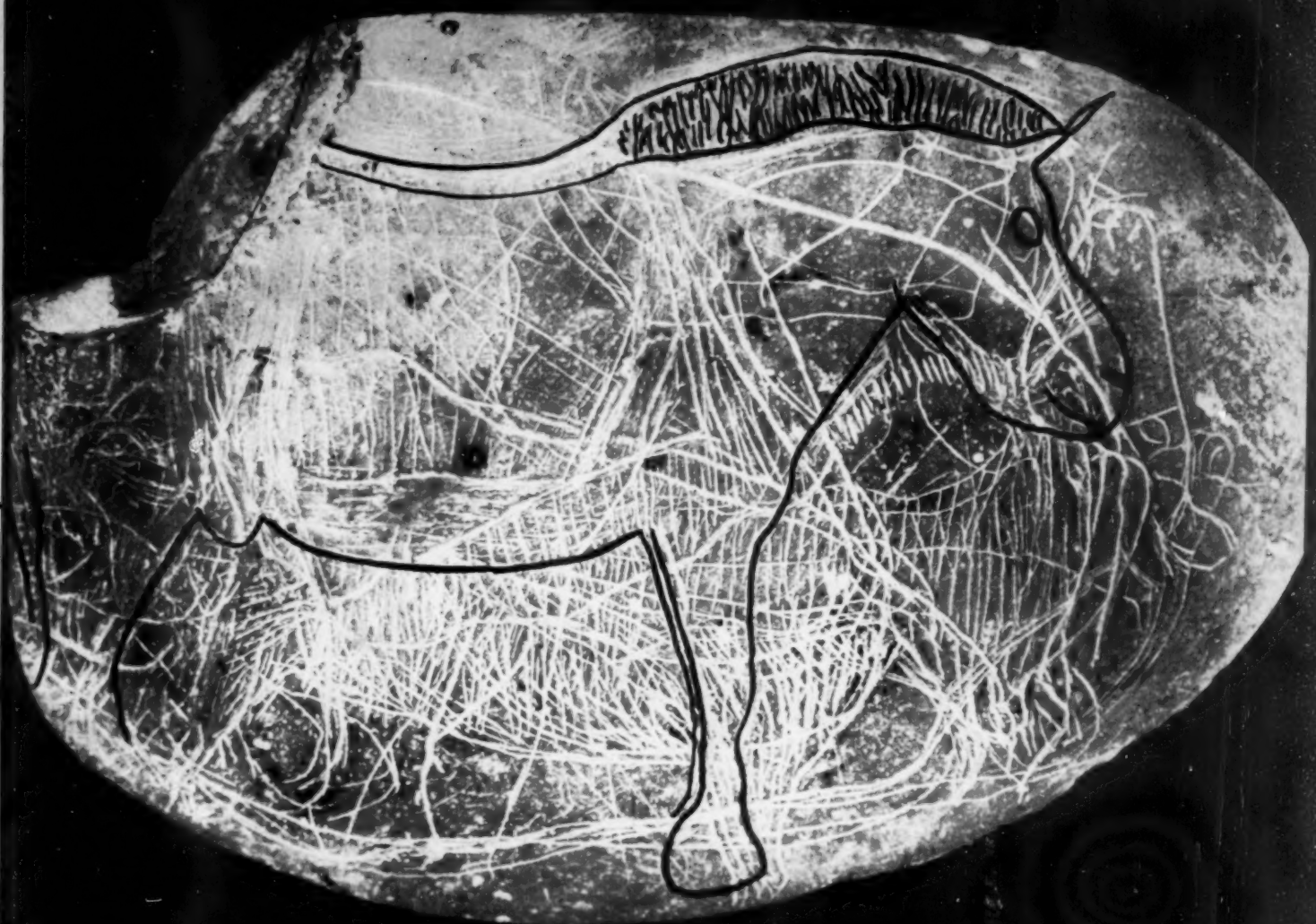
MARCH 26, 1949

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE



Prehistoric Hunters' Prey

See Page 198

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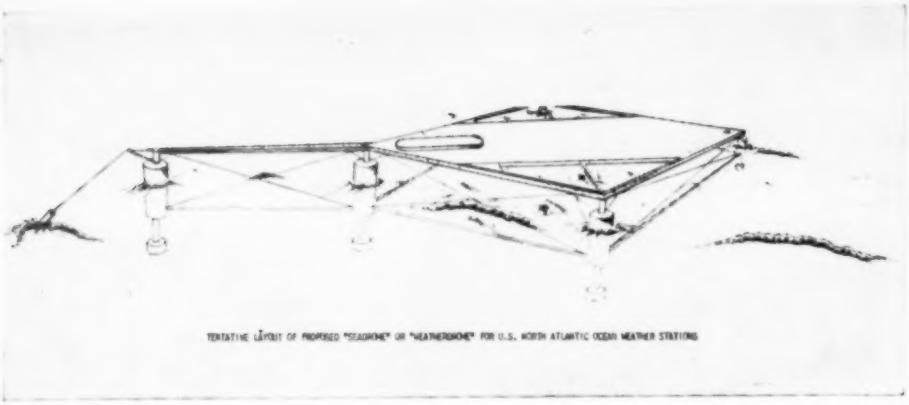

TENTATIVE LAYOUT OF PROPOSED "SEADROME" OR "WEATHERDROME" FOR U.S. NORTH ATLANTIC OCEAN WEATHER STATIONS

OCEAN WEATHER STATION—This is an artist's conception of a 2,000-ton, 450-foot proposed weatherdrome for weather observations in the Atlantic.

PHYSIOLOGY

Cell Details Studied

Researchers of three countries are using electrons and X-rays to discover facts about cells. Methods for slicing cross-sections of bacteria have been developed.

➤ NEW peeks at living cells of which you and all other living things are made have been taken by scientists of three countries.

Their findings, reported in the British journal, NATURE (Feb. 19), show that:

The heart, or nucleus of the living cell has a double-layer coat.

Whip-like propelling organs, called flagella, are like hair or muscle on the cells of bacteria.

Two new methods of slicing out cross-sections of the tiniest of living cells, those of bacteria, have been developed.

Four teams of scientists from the U. S., Britain and Sweden have made these new studies of the building blocks of living things.

The nuclear membrane, which holds the materials that dominate the cell's life activities and the genes that pass hereditary qualities on to the next generation, was peeled off large reproductive nuclei of tailed amphibian species and examined under the electron microscope. This was done by H. G. Callan of the Institute of Animal Genetics at Edinburgh, and J. T. Randall and S. G. Tomlin of King's College, London.

Preparation required a very delicate dissecting operation with minute instruments, conducted under an ordinary microscope. The peeled membrane was stretched on a copper holder and dried before the electron beam was turned on it.

Photographs made under the electron microscope show the nuclear membrane to have a double structure. One layer is like a colander, full of exceedingly minute holes arranged in a hexagonal pattern. The other layer has no discernible structure. The three scientists believe that the latter layer is the one that controls transfusion, or the passage of dissolved substances, into and out of the nucleus. The layer with the holes, they believe, serves only for mechanical support of this structureless layer.

International cooperation between Britain and Sweden was involved in the X-ray analysis of exceedingly minute, whip-like propelling organs, or flagella, of bacterial cells. This study was conducted by W. T. Astbury of the University of Leeds and C. Weibull of the University of Uppsala. They were able to get the flagella separated from the bacterial cells and stretched out in a thin film. From the X-ray point of view, they state, these minute cell-organs are comparable to hairs or muscles, since they contain protein groups common to the two larger structures.

Two different methods of making cross-sections of the minutest of all cells, those of bacteria, are reported. Richard F. Baker and Daniel C. Pease of the University of Southern California School of Medicine embed large bacterial cells in paraffin and slice them to a thinness of a quarter-millionth of an inch, in preparation for electron-microscope examination and photography.

In Stockholm, A. Helge F. Laurell of the Physical Research Institute first glues bacteria to a glass slide. He then covers them with an ultra-thin beryllium film and strips off the film, bringing parts of the bacterial structure with it. Repetitions of this process obtain sections deeper into the cells.

Science News Letter, March 26, 1949

METEOROLOGY

Floating Weatherdromes Proposed for Atlantic

➤ FLOATING anchored weatherdromes are suggested by the U. S. Coast Guard to be used instead of vessels as weather stations in the Atlantic and other waters. Authorizing legislation has been requested from Congress. Economy is the objective.

These proposed seadromes are somewhat similar to those suggested when planes were learning to fly the Atlantic, but these will not be used for landing fields. Each would hold a weather station and quarters for a crew of 80 men. They would provide continuous information on weather conditions to shore stations by radio.

The platform of the "drome" would be supported on five pylons extending 175 feet downward into the water. These, according to inventor Edward R. Armstrong, Sun Shipbuilding and Dry Dock Corporation, would offer but little wave resistance, keeping the platform stable at sea.

It takes three vessels with a crew of 120 officers and men each to man continuously one ocean station, officials of the Coast Guard say. The use of seadromes would save the need for about 200 men. Also, there would be a decrease in the cost of operating because the weatherdrome has no means of propulsion and, when once positioned, remains anchored. If Congress approves the idea, money for construction will be requested later.

Science News Letter, March 26, 1949

INVENTION

Auto-Skidding Prevented With Spiked Rollers

➤ WITH one of the "skiddiest" winters in weather history just receding into the past (maybe) in the West and Midwest, more than passing interest attaches to devices intended to prevent automobiles from skidding. An appliance of this kind is the subject of U. S. patent 2,463,634, just issued to Ernest L. Martinis of Southgate, Ky.

It consists of a pair of cylinders some eight or 10 inches in diameter, with short spikes to bite into the slippery road surface. These are mounted directly back of the rear wheels, but are kept swung up out of sight in the streamlined rear portions of the rear fenders when not needed.

When an emergency arises, quick pressure on a pedal swings them down until they bear on the road surface. At the same time, a pair of smaller rollers interposed between them and the wheels transmits power from the tires to the spiked rollers, causing them to turn in the same direction as the wheels. The spikes automatically claw for a firmer hold on the road, and the skid is brought to an end.

Science News Letter, March 26, 1949

MEDICINE

Asthma Drugs Promising

Two new drugs that can be taken by mouth to relieve asthma will soon be tested on patients. Three new drugs hold promise of relieving palsy in old people.

➤ TWO new anti-asthma drugs are very soon going out to doctors for experimental testing on patients. If successful, they will be the first drugs that can be given by mouth to dilate the bronchial tubes and thus give relief to asthma sufferers.

The drugs are so new they do not even have names yet. Their existence was revealed when Dr. Edwin J. Fellows, head of the pharmacology section of Smith, Kline and French Laboratories in Philadelphia, showed doctors attending an SKF-sponsored medical research conference on old age how the drugs are being tested on guinea pigs.

The drugs belong to the chemical group known as alkyl aryl amines. Guinea pigs in the test are first given two chemicals, histamine and one with acetylcholine-like action, to induce in the pigs the kind of breathing difficulty asthma patients have. Dr. Fellows emphasized that his group is not looking for a drug with anti-histamine action only. A number of such drugs, for example benadryl and pyribenzamine, have been developed, but have not been entirely successful in asthma, though useful in other conditions.

The pigs are timed in the morning to see how long it takes for them to develop breathing difficulty under the histamine and acetylcholine-like chemicals. In the afternoon they are given pretreatment with one of the new anti-asthma chemicals. Then they are again clocked to see how long it takes before the histamine and acetylcholine-like chemicals bring on breathing trouble. These last two chemicals are sprayed into the pigs' cages through a very fine atomizer.

Results so far have made Dr. Fellows quite enthusiastic about the new anti-asthma drugs.

The promise of relieving paralysis agitans, the distressing palsy of old people, shown by three new drugs gives hope that other drugs can be developed to relieve other characteristic infirmities of age, Dr. Chauncey D. Leake, of the University of Texas medical branch at Galveston, declared at the meeting.

The three drugs are: 1. myanesin, or tolserol; 2. parpanit; 3. phenothiazine compounds. Still another group of chemicals, called benzimidzols, have also been proposed for this condition. In mentioning these chemicals, Dr. Leake cited reports from several scientists other than himself.

"There is strong possibility that cancer may be prevented or cured," Dr. Leake said in discussing drugs needed for the chief diseases of old age.

"There does not seem to be the possibility of maintaining the heart, blood vessels and kidneys in effective functioning condition indefinitely. And besides, do any of us want to?" he asked, pointing out that "death is a part of life and for new life to be possible it is necessary at some time or other to get rid of the encumbrances of old life."

Dr. Leake believes it will be possible to develop drugs which will make old people more comfortable, relieve muscle tension without inducing incoordination or drunkenness, stimulate brain activity without inducing nervousness and keep the digestive system in good order so as to promote the enjoyment of eating.

A four-point program for old age beginning in high school was another of his suggestions for meeting the situation where for the first time in history we have more people over age 35 than under it.

Science News Letter, March 26, 1949

PSYCHIATRY

Emotions Affect Eyesight

➤ EYE disease affecting vision can now be added to stomach ulcers, colitis, asthma and other ailments brought on by emotional disturbances.

"We have numerous case histories of definite organic disease of the eyes and brain which are either caused or complicated by ocular psycho-neurosis," Dr. Henry L. Birge of Hartford, Conn., declared at the fortieth anniversary conference of the National Society for the Prevention of Blindness in New York.

One such case was that of a night watchman who developed glaucoma immediately after the nervous shock of being struck in the face with flame and smoke from a fire he had discovered. Glaucoma can cause blindness, although early, adequate treatment will save the eyesight in many cases.

Close cooperation is needed between general practitioners, eye specialists and psychiatrists, Dr. Birge emphasized, in order properly to diagnose and treat defective eyesight which may be induced by emotional

***DRUG'S EFFECTS CHARTED**—A new electronic apparatus for determining the effects of new drugs on the central nervous system is shown being operated here. The recording of the animals' responses is made on the chart at the left. The device was developed by R. A. McLean of Smith, Kline & French Laboratories.*

disturbances.

Glaucoma is the most serious eye problem of middle age, with cataract next most important, Dr. Edwin B. Dunphy of Boston stated at the meeting. Early symptoms of cataract are often confused with those of glaucoma.

Less serious but "the most annoying and most universal inconvenience of middle age" is the condition laymen call farsightedness. Presbyopia is the medical name for the condition. In this condition the eye loses some of its ability to accommodate itself to different focal distances and light intensities. The condition, Dr. Dunphy said, is due more to lack of elasticity of the eye lens than to weakness of the muscle which contracts the lens.

Science News Letter, March 26, 1949

BACTERIOLOGY

Germ Warfare Antidotes

We have ways of defending ourselves against biological warfare, Defense Secretary Forrestal assures, but not against the atom bomb.

➤ YOU NEED not be as afraid of germ warfare as of atom bombs. This conclusion may be drawn from the statements on germ, or biological, warfare by Secretary of Defense James Forrestal and Maj. Gen. Alden H. Waitt, chief of the Army Chemical Corps which carries on our biological warfare research.

Both said that germs or their poisons could be used as military weapons. But both were reassuring in their statements that we have ways of defending ourselves against such weapons. So far, no one has been quite that optimistic about defense against the atom bomb.

"It should be appreciated," Secretary Forrestal said, "that illness induced by biological agents may be counteracted by specific medical measures."

The toxin produced by botulinus germs is probably the most poisonous known substance per unit of weight. This is the stuff an ounce of which would be enough to kill about 200,000,000 people, though practically it would be impossible to spread it in such a way as to get it into that many people. But we have developed a toxoid that protects against this most poisonous substance.

Anthrax germs produce a substance almost as poisonous as the botulinus toxin. Our biological warfare scientists worked on this problem, too, during the war. They found that penicillin was an effective remedy against one form of anthrax. Whether it will remedy all forms has not yet been reported.

Plague has always been mentioned as a possible germ weapon in war. One of the first reports released by the Navy on its biological warfare activities during the war suggested, without actually stating, that Navy scientists had developed defenses against this disease. Since then, civilian scientists have found a remedy for the disease in streptomycin.

Penicillin and streptomycin, with newer antibiotics such as chloromycetin and aureomycin and various sulfa drugs, give us powerful remedies for a host of germ diseases.

Germ warfare might be waged against animals and plants that man needs for food. In these fields, also, our scientists built notable defenses. Vaccines were developed against the cattle plague, rinderpest, and against two highly fatal poultry maladies, Newcastle disease and fowl plague.

Less spectacular but important for defense against germ warfare is the development of quick, sure tests for various disease germs. That this has not been neglected may be guessed from Secretary Forrestal's statement that "an important defense against biological warfare lies in the early identification of diseases implanted."

Science News Letter, March 26, 1949

Question Box

AERONAUTICS

What is the principal application of the thrust augmentation methods? p. 206.

ASTRONOMY

What is the astronomical event slated for April 12? p. 202.

BACTERIOLOGY

What defense do we have against germ warfare? p. 196.

BIOCHEMISTRY

What is the medical significance of radiation immunity experiments? p. 197.

GEOGRAPHY

Why is Denmark wanted in the North Atlantic Defense Pact? p. 198.

MEDICINE

What new development is promised in asthma treatment? p. 195.

PHYSIOLOGY

What new facts have been discovered about body cells? p. 194.

PSYCHIATRY

How are eyes affected by the emotions? p. 195.

SOCIOLOGY-AGRICULTURE

What is the "Double Crisis" faced by the peoples of the world today? p. 199.

Photographs: Cover, p. 198, Harvard University; p. 194, U. S. Coast Guard; p. 195, Smith, Kline and French Laboratories; p. 197, National Bureau of Standards.

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BIOCHEMISTRY

Study Radiation Immunity

Laboratory experiments with mice indicate that an individual's sensitivity to radiations can be made greater or less. This may be significant in cancer treatment.

➤ IT MAY be possible in the future to make a person more resistant to radiations such as X-rays or even the potent radiations of an atomic bomb blast.

Scientific research holding out the possibility of some day giving humans at least some degree of immunity to radiations has been reported to the National Academy of Sciences in Washington.

The new findings, so far limited to experiments with laboratory mice, may also lead to more effective treatment of cancer. The study was made by a husband-wife team of scientists, Dr. John B. and Ruth M. Graham, formerly of the Vincent Memorial Laboratory at the Vincent Memorial Hospital in Boston and now at the University of Oregon Medical School, Portland.

Scientists have generally assumed that a person's response to radiations was unchanging and could not be altered.

"We believe this assumption is erroneous," declare Dr. and Mrs. Graham.

To test their theory, they injected Swiss mice with certain chemical compounds and then exposed them to radiation. Some groups of treated mice showed markedly higher casualties than the controls which had not had any of the compounds. Other groups which had been given different chemicals had more survivors than the controls.

In a preliminary report of their work, the scientists conclude that an individual's sensitivity to radiation can be made greater or less. Either greater or lesser sensitivity to radiations would be useful and perhaps life-saving.

Some immunity might help protect atomic age workers who may be exposed to radiations in industry and scientific laboratories, and even, perhaps, some persons at a distance from the center of an atomic bomb blast.

Greater sensitivity to radiation might prove useful in cancer treatment with radiation.

A theory on the varying effectiveness of radiation treatments on different cancer victims led the Grahams to their present research. They believe that in radiation treatment of cancer the reaction of normal tissue to the treatment "is at least as important" as the sensitivity of the tumor.

They found radiation reaction in both normal and malignant cells of many patients who improved under treatment. The normal cells showed no response to the radiation in many of the patients who did not improve. Thus, they suggest, tests on normal cells, rather than tumors, may tell the physician most reliably whether his patient is likely to improve.

Laboratory mice were given various substances, some 10 days before radiation and others immediately after radiation. Results in terms of mouse mortality varied not only between the substances and the time when given but also by the sex of the mice.

Horse serum administered 10 days before the radiation treatment cut mortality in 40 days to zero, compared with 21% and 28% losses among male and female controls which were exposed to the same amount of radiation. But when the serum was given immediately after radiation, deaths more than doubled in comparison with the controls.

Other substances given the mice which produced varying differences from controls in the radiation experiments were male and female hormones and adrenal gland cortical hormone.

From their experiments, Dr. and Mrs. Graham said, "We conclude that an individual's sensitivity to ionizing radiation may be either enhanced or diminished by the administration of certain steroids or foreign protein before or after radiation.

"It is possible that this observation may have some bearing on survival from total body radiation and on the effectiveness of radiation treatment of cancer."

If other scientists confirm the Grahams' findings, a new approach to radiation problems may be opened for the much-heralded atomic age.

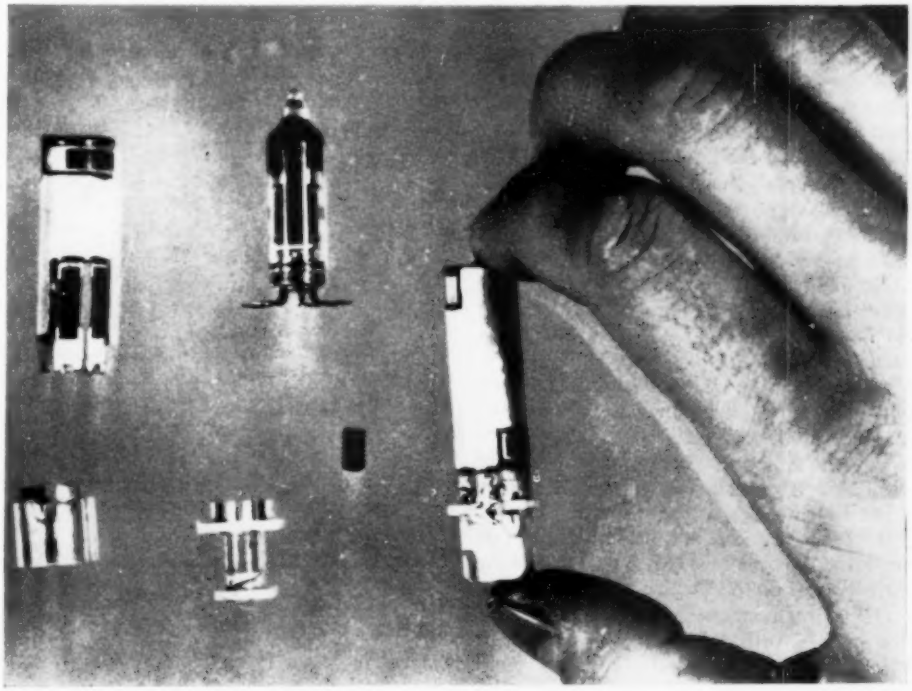
Science News Letter, March 26, 1949

ELECTRONICS

Tiny Electronic Assembly

➤ PLUG-IN units containing the entire assembly used with delicate tiny electronic devices, such as broad-band, high-gain, intermediate-frequency amplifiers for aircraft and missiles, have been developed by the National Bureau of Standards. The objective is to obtain the smallest possible volume for the equipment, and a unit easily handled.

Such electronic assemblies are known as subminiature electronic devices when their volume is compacted to a dimensional



SUBMINIATURE ELECTRONIC TUBES—These will be used for plug-in units with other tiny electronic devices in aircraft. The objective for the packaging is to obtain the smallest possible volume for the equipment and a unit easily handled.

limit imposed by the smallest available electron tube. In making a single package to include the tube and other components, the shape as well as the size of the plug-in unit is a consideration.

The extreme compactness brings about higher internal temperatures than are usually encountered in conventional assemblies. Because of this, insulating materials commonly used are not satisfactory. Ceramics, vitreous enamels, and silicone-bonded bodies are used in the subminiature unit.

Low-dielectric-constant (low-K) ceramics, such as steatite, are used in preference to organic insulating material. The high-K titanate ceramics can serve not only as satisfactory printed-circuit base materials but also as miniature capacitor dielectrics. Fashioning the high-K ceramics bodies into cylinders makes them stronger than they would be in flat shape. These ceramic cylinders are made to play a multiple role as capacitors, tube shields, stand-off insulators, and base material for printed wiring.

The intermediate-frequency amplifier chosen by the Bureau for miniaturization embodies a type of critical circuit layout which represents the most typical problems. Two methods of fabrication were employed in their construction. One assembly was designed so that it could be readily manufactured by techniques similar to those now employed in the electronic industry. The other, a printed circuit assembly, was made to the same general specifications as the first which uses standard miniature components.

Science News Letter, March 26, 1949

GEOGRAPHY

Denmark Wanted in Pact

➤ TWO important reasons why Denmark is wanted in the group signing the North Atlantic Defense Pact are based on the nation's geographical position:

1. Denmark can control ship passage from the Baltic Sea to the Atlantic Ocean.
2. Denmark owns strategically located Greenland.

It is not the mainland Denmark on the Jutland peninsula that is the principal block in the water route from the Baltic to the ocean. It is the many islands between the peninsula and the southwest coast of Sweden, of which Sjalland is the largest and most important. It is on this island that Copenhagen, the Danish capital, is located. The north coast of the island is on the Kattegat, which separates the Jutland peninsula from Sweden and is the connecting waters between the Baltic and the Skagerrak and the North Sea.

Two passageways are available for ocean vessels and submarines, one to the east of Sjalland which, in its narrowest place, is only about a dozen miles wide, and the other to the west through what is known as Store Belt in whose waters are many small islands.

One important reason behind the construction of the Kiel canal across the German part of the Jutland peninsula was to give the German nation a way out of the Baltic without passage through Danish waters. Denmark's strategic position in controlling the entrance to the Baltic was one of Hitler's principal reasons for taking early possession of Danish territory.

Greenland's strategic value is its location in the North Atlantic close to the Great Circle air and ocean surface routes from America to Europe. Along with Iceland, a probable signer of the North Atlantic Pact, it is a stepping stone on the route from Labrador to the Scandinavian peninsula. Its southern shore area is suitable for emergency landing fields which could easily become refueling stations for giant bombers traveling either eastward or westward.

Greenland is the largest island in the world if Australia is rated as a continent. While much of it is ice-bound, its southern shores are temperate enough to support its present population of approximately 20,000—stockmen, fishermen and miners. Weather stations on the island are of great value to air and surface ships passing to the south. Radar stations on the island could locate approaching planes, and loran stations would help navigators.

Science News Letter, March 26, 1949

ARCHAEOLOGY

Stone-Age Game Animals Shown on Engraved Pebble

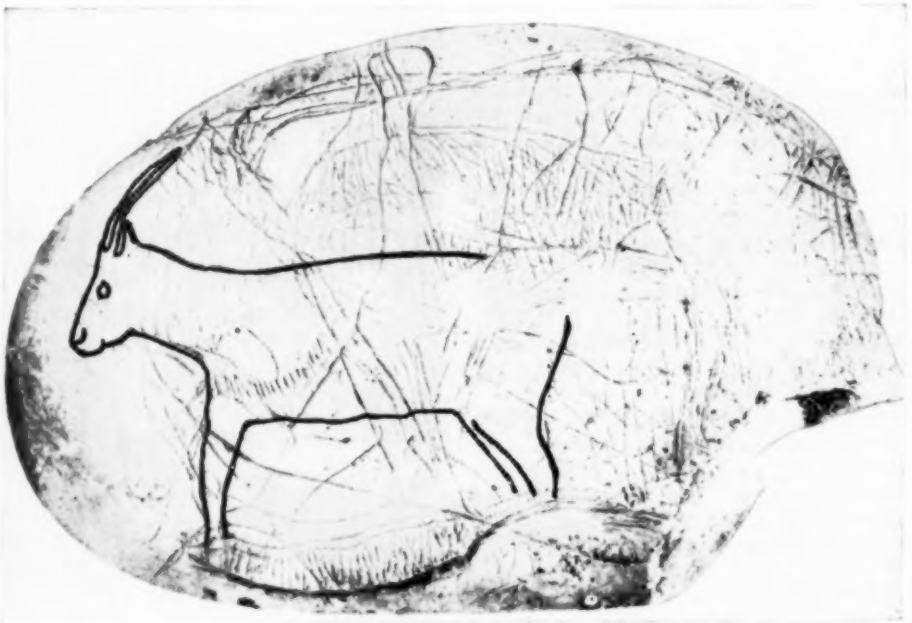
See Front Cover

➤ ANIMALS that cave-men hunted in the later Old Stone Age, some 20,000 to 25,000 years ago, are shown in a mass of finely engraved lines on a large rounded pebble, the size and shape of a big potato, found at the La Colombiere rock shelter in eastern France and now at the Peabody Museum of Harvard University. The find was announced by Dr. Hallam L. Movius, Jr., curator of palaeolithic archaeology.

Similar engraved pebbles have been found in the past, but this is regarded as one of the finest specimens of its kind ever discovered. The drawings, which show such animals as horse, ibex, rhinoceros and bison, are carved one over the other, so that it is somewhat difficult to make out what some of the animals are. One stocky horse figure, however, stands out with particular clearness, as shown on this week's cover of the SCIENCE NEWS LETTER. It has been gone over in ink to make it stand out from the other animals on the face of the stone. The head of an ibex and reindeer can be seen directly in front of the horse's nostrils when the picture is turned upside-down. The ibex is outlined below.

Nobody knows what purpose, if any, these portable art objects served, Dr. Movius states. It is conjectured that they may have had religious or magical significance.

Science News Letter, March 26, 1949



ANCIENT GAME—The picture of an ibex, gone over with ink to make it stand out, is one of several animals engraved on the La Colombiere pebble. A horse can be seen directly beneath the legs of the ibex when the picture is turned upside down, as shown on the cover.

SOCIOLOGY-AGRICULTURE

The Double Crisis

What can be done about world population that threatens to outstrip food resources? First of two articles keynoting UNESCO "Food and People" discussion.

The world's food resources are being used very unevenly and very wastefully. The world can ill afford this, for its population is growing at a rate of more than 20,000,000 a year.

The United Nations Educational, Scientific and Cultural Organization has selected "Food and People" as a major discussion topic for this year, inviting schools, clubs, organizations, etc. to give attention to this world problem.

Upon UNESCO's invitation, Aldous Huxley, the British author, has written this challenging article which SCIENCE NEWS LETTER *presents to its readers in cooperation with UNESCO. Next week's issue will continue the discussion with a reply by Sir E. John Russell, the British agricultural scientist.*

By ALDOUS HUXLEY

➤ THE HUMAN RACE is passing through a time of crisis, and that crisis exists, so to speak, on two levels—an upper level of political and economic crisis and a lower-level crisis in population and world resources. That which is discussed at international conferences and in the newspapers is the upper-level crisis—the crisis whose immediate causes are the economic breakdown due to the War and the struggle for power between national groups possessing, or about to possess, the means of mass extermination. Of the low-level crisis, the crisis in population and world resources, hardly anything is heard in the press, on the radio or at the more important international conferences. And yet the low-level crisis is at least as serious as the crisis in the political and economic field. Moreover, the problems on the upper level cannot be solved without reference to the problems that are shaping up in the cosmic and biological basement. If it is ignored, the low-level crisis is bound to sharpen the crisis on the political and economic levels. At the same time, a concentration of attention and energy on power politics and power economics will make a solution of the low-level problems not merely difficult, but impossible. In what follows I propose to discuss certain aspects of the low-level crisis and to point out how the obscure happenings in the basement have affected and are likely to go on affecting the lives of private individuals, the policies of statesmen and the conduct of nations.

It has been fashionable for some time past to talk about "poverty in the midst of plenty". The phrase implies that the planet possesses abundant resources to feed, clothe, house and provide amenities for its existing population and for any immediately foreseeable increase in that population, and that the present miseries of the human race are due entirely to faulty methods of production and, above all, of distribution. Given currency reform, socialism, communism, unrestricted capitalism, distributism, or whatever the favorite remedy may be, humanity, like the prince and princess in the fairy stories, will be able to live happily ever after. Want and hunger will be transformed into abundance and the whole earth will become one vast Land of Cockayne.

Such are the miracles to be achieved by political and economic planning. But when we pass from these high-level considerations to a study of what is going on at the biological and ecological levels, our optimism is apt to seem a little premature, to say the least of it. Instead of poverty in the midst of plenty, we then find that there is poverty in the midst of poverty. World resources are inadequate to world population. At the present time, our planet supports a little less than 2,250,000,000 human beings, and the area of food-producing land is in the neighborhood of 4,000,000,000 acres. It has been calculated that two and a half acres of land are needed to provide a human being with a diet which nutritionists would regard as adequate. (This may be an extreme estimate but I shall take it as the basis of what I have to say.) Thus, even if all the available productive land were good—and much of it is of very poor quality—the existing population could not be assured of an adequate diet. Actually, in order to bring all the people in the world who are at a very low nutritional level up to even a modest level of adequacy within the next 25 years, the prewar food supply would have to be doubled. But this cannot be accomplished overnight. In the words of Dr. Thomas Parran, the former Surgeon-General of the U. S. Public Health Service, "the greatest possible increase in food production will not for decades be enough to meet the minimum adequate diet." And world population will continue to rise. It is rising at the rate of about 200,000,000 every 10 years.

Moreover, while population goes up, the fertility of the soil declines. "Modern man", writes Ward Shepard in his recently published book, FOOD OR FAMINE, "has perfected two devices, either of which is capable of annihilating civilization. One is atomic war, the other is world soil erosion. Of the two, soil erosion is the more insidiously destructive. War disrupts or destroys the social environment, which is the matrix of civilization. Soil erosion destroys the natural environment, which is its foundation." In other words, atomic warfare can destroy one particular civilization; soil erosion can put an end to the very possibility of any civilization. Favorable weather has prevailed in North America for the last 10 years and, in consequence, we hear much less of erosion than was heard during that succession of dry seasons which called the Dust Bowl into existence. Nevertheless, in spite of considerable improvement in agricultural practices, soil erosion still goes on and is likely, as soon as the continental weather takes another turn for the worse, to assume the same disastrous proportions as it did in the 'thirties. Already enormous areas have been partially or completely sterilized, and millions of acres more are destined to suffer the same fate. But within the next 25 years, the population of the United States will rise (if nothing untoward happens in the interval) by about 30,000,000. There will be more mouths to feed from a diminishing area of productive land.

What is happening in North America is happening also in other parts of the world. Erosion is rampant all over Africa, where a rapidly increasing native population clings tenaciously to its old habit of measuring social status in terms of cattle. There are more people, therefore more cows, therefore more over-grazing, therefore more soil erosion. In Asia, too, the same irreparable damage is being done to the very foundations of any possible civilization. Human poverty exists in the midst of a steadily increasing natural poverty.

Sound practices have combined with a climate that is without extremes to provide Western Europe with a tolerably stable agriculture. Its farmers produce good crops without, in the process, destroying the soil. But however good these crops may be, they are insufficient to provide the present population of Western Europe with even its minimum good requirements. In relation to the local food supply, Western Europe is over-populated. Since 1800, Western Europe has trebled its population. This increase was made possible by the exploitation of the empty and agriculturally virgin territories of the New World. Today, the New World has a large and rapidly increasing population of its own, and its soil, after more than a century of abuse, is losing its fertility. There is still a very large exportable surplus of food; but as numbers go up, and fertility goes down, there will be less and less to spare

for the hungry in other parts of the world. Moreover, the manufactured articles which Western Europe exchanged for food and raw materials have tended to become less acceptable in proportion as the nations of the New World have developed their own industries. Europe will find it more and more difficult to pay for supplies which, as the population pressure on the New World's eroded soil increases, are bound to diminish. And this will happen at a time when a newly-industrialized Asia will be in a position to compete for whatever surpluses of food the New World can still make available to the Old.

Food is a renewable commodity. If the soil is not abused, this year's harvest will be succeeded by next year's. But the vein of tin or copper which produced this year's output of ore will not be renewed in years to come. When the lode has been worked out, the miner must move on to another deposit of the mine. And if he can find no other deposits—well, that is just too bad. Industrialism is the systematic exploitation of wasting assets. The thing we call progress is, in many cases, simply acceleration in the rate of that exploitation. And such prosperity as we have known up to the present is the consequence of rapidly spending the planet's irreplaceable capital.

How long can the accelerating dissipation of capital go on? How soon will the wasting assets of the world be exhausted? All we know for certain is that the supplies of many hitherto essential commodities are limited and that, in many places, very rich and easily available deposits of those commodities have been, or are in process of being, worked out. Thus, in the United States, high-grade iron ore is running low; so are zinc, copper, lead; so is petroleum. And this is happening at a time when a rising population with steadily improving methods of production is calling for ever increasing quantities of consumer goods—in other words, is making ever heavier demands on the limited reserves of our planetary capital.

Further Complications

Up to this point, I have dealt with world population as a single undifferentiated whole. The problem thus posed is that of increasing pressure upon diminishing resources. But this basic problem of our time is deepened and complicated by the fact that rates of increase are not uniform throughout the world's population. Different birth rates as between the various peoples of the earth, and as between classes within a people, are rapidly engendering a host of new problems.

In Western Europe and North America, the over-all birth rate has sharply declined in the course of the last 50 or 60 years. Because of the lowered death rate and the relatively large numbers of persons within the reproductive age groups, this decline in the birth rate has not yet manifested itself in a net decline of population. But the onset of such a decline is close at hand. For example, by 1970 the population of France and Great Britain will have declined by about 4,000,000 apiece, and the number of persons over 65 will be approximately equal to the number of those under 15. Similar declines are due, at a slightly later date, in the other countries of Western Europe and in the New World (except South America). Meanwhile, in spite of much higher death rates, the population of Eastern Europe and of Asia is destined to go on increasing. By the end of the present century, Asia alone will have a population of about 2,000,000,000. And in 1970, when Western Europe will have some 9,000,000 fewer inhabitants than it possesses today, Russia will have gained upwards of 75,000,000.

Food and Politics

In the preceding paragraphs, I have indicated, in baldest outline, the nature of the lower-level crisis through which humanity is now passing—a crisis which, so far as we can see, will grow more acute with every year that passes. We have now to consider how these untoward events on the biological level have affected, and are likely in the future to affect, behavior on the levels of international and domestic politics, and how the more dangerous symptoms might be palliated during the long period required for removing the underlying causes.

An unfavorable relationship between population and natural resources creates a permanent menace to peace and a permanent menace to political and personal liberty. In our days, whether there is a threat to peace depends upon whether an overpopulated country possesses an industrial plant capable of producing armaments. There can be no aggression without the means to aggression. Lacking these means, the people of an overpopulated country are confronted with only two alternatives. They can either stop breeding, and so reduce the population. Or else, they can go on breeding until famine, disease, political unrest and civil war combine to raise the death rate to the point where a decreased population can reestablish a favorable relationship with natural resources. But some overpopulated countries are also industrialized; and for these, there is a third alternative: to enslave or exterminate their neighbors, and so acquire more land, food, raw materials and markets.

Remembering that "God is on the side of the big battalions", the military leaders of industrialized countries with high birth rates will feel confident of winning any war they care to wage against the countries with low birth rates. And remembering that David killed Goliath with a stone from his sling, the military leaders of the countries with low birth rates will come to believe that their only chance of survival consists in using, before it is too late, their technical superiority in atomic and biological weapons, in order to offset the effect of the big battalions. So long as it remains axiomatic that nations exist for the purpose of damaging or destroying one another, the unequal increase of world population is no less dangerous, politically speaking, than the over-all increase of population pressure on resources.

A World Population Policy?

The world's underlying population crisis can only be relieved through the adoption, by all nations, of a world policy, aiming at the stabilization of population at a figure at which the relationship between numbers and resources, numbers and the amenities of life, shall be most favorable. As things are at present, no political foresight is possible, since the rapid changes in the absolute and relative numbers of human beings create a constantly varying social, economic and political environment. A rational control of human destiny depends on the existence of a stable world population with low death rate. It doesn't make sense to talk about Human Dignity and the Four Freedoms in relation to some Far Eastern countries where, say, almost half of the inhabitants die before they are 10 years old; where two-thirds die before they are 30; and where, none the less, the total population rises by tens of millions every decade. The "giant misery of the world" cannot be mitigated by inspirational twaddle, but only by an intelligent attack upon the causes of that misery.

It is, of course, a great deal easier to talk about a world population policy than it is to get such a policy accepted by the various national governments; and it will be easier to get the policy accepted than to get it implemented. Moreover, even if it should, by some miracle, come to be accepted and implemented immediately, the beneficent results could not, in the nature of things, be apparent for several generations. Let us elaborate a little on this depressing theme.

So long as idolatrous nationalism remains the effective religion of mankind, and so long as it is taken for granted that war is right, proper and inevitable, no government of a country with a high birth rate will pledge itself to the reduction of that rate; and no government of a country with a low birth rate will forego in advance the privilege of trying to increase that rate with a view of increasing the size of its armed forces.

Assuming now, for the sake of argument, that, in spite of nationalism and militarism, a world population policy should be agreed upon, how easy would it be to get that policy implemented? The answer is that, in the countries where its immediate implementation would be most desirable, it would be exceedingly difficult, indeed almost impossible, to do so. For a variety of reasons, material and psychological, birth control is not practised by persons

whose standard of living falls below a certain level, and this level, for the great majority of Asiatics and even of Eastern Europeans, is unattainably high. To obtain any conscious or deliberate reduction of the high birth rates prevailing in the East would be a task requiring many years of education and technological advance.

Finally, even if a substantial cut in the present high birth rates of the world were to take place tomorrow, the number of persons in the reproductive age groups is at present so large that, despite the reduced birth rate, over-all population would continue to increase until at least the end of the present century. In the most favorable circumstances we can reasonably imagine, world population is bound to rise to at least 3,000,000,000 before it starts to decline. This means that, whatever happens, the next half century will be a time of the gravest political and economic danger. If a world population policy should be agreed upon and implemented in the near future, this danger may be expected to grow less acute after about the year 2000. If no such policy is adopted, the crisis is likely, unless something startlingly good or something startlingly bad should happen in the interval, to persist for many years thereafter. The adoption of a population policy is a goal at which we should certainly aim; but while we are waiting for it first to be agreed upon and then to take effect, we must do what we can to minimize the dangers to peace and liberty which are inseparable from overpopulation.

The problem requires simultaneous attack on several fronts—the ideological front, the organizational front and the scientific-technological front. On the ideological front, the formidable enemy to peace is nationalism; for it is in the context of nationalistic thinking that overpopulation becomes most dangerous. The depth and sincerity of religious belief are measured by the sacrifices which the believer is prepared to make for it. At the present time, there are probably a thousand men and women prepared to undergo martyrdom for the local national idol, to every one who would willingly die for his or her belief in God. Of all the motives for mass action, nationalism is, at present, by far the most potent.

The idea that war between nations is right, proper and inevitable, remains a kind of axiom and, as it were, a necessity of thought. The appalling experiences of the last 30 years have taught collective humanity precisely nothing. The nations of the world continue to think and feel and act in the same old ways—the ways that are positively guaranteed to lead to catastrophe. If social aggregates fail to learn by even the bitterest kind of experience, how is the indispensable lesson to be imparted?

The Contribution of Science

From the ideological and organizational approach to the problem of war, we pass to the scientific and technological. Workers in the fields of pure and applied science are in a position to make two important contributions to the cause of peace. They can refuse to take part in the current preparations for the mass extermination of civilians. And, supplementing negative by positive actions, they can work for the palliation of those consequences of overpopulation, which are among the basic causes of war. Of the first course of action, I need say no more than that the question of taking it or not taking it is for the individual to decide. Some scientific workers regard it as a matter of duty to place their knowledge at the service of the State; others regard it as a duty to refuse to participate in research whose avowed purpose is the discovery of improved methods of slaughter. It is a matter of conscience.

In regard to the morality of positive scientific action, there can be no difference of opinion; nor, I think, can there be serious disagreement about the basic objectives to be aimed at. The facts are only too obvious. We have, as a species, a rapidly rising population which cannot, under present conditions, be adequately fed. Over large areas of the earth, soil erosion is gnawing at the foundations of any possible civilization. Moreover, the dominant civilization of our time—Western industrialism—is based upon the ever more efficient exploitation of wasting assets. While waiting for a world population policy to take effect, we can and we should use the resources of applied science to increase the food supply, to check erosion, to conserve the rapidly disappearing basis of industrial prosperity and, at the same time, to see what can be done to shift our civilization on to a less precarious foundation.

The world's supply of food can be increased in the following ways: by improving existing methods of production, conservation and distribution; by opening up hitherto unexploited areas of land and sea; and by developing techniques for transforming easily available materials into nourishment, either directly for man or indirectly for his domesticated animals, insects and fungi.

The Food and Agriculture Organization of the United Nations exists for the purpose of considering, and making recommendations about these methods of increasing the world's food supply. The Organization possesses no authority, and one of its most ambitious schemes, the Orr Plan for a World Food Board empowered to buy and distribute surpluses, to stabilize prices and preserve an "ever-normal granary", has been rejected by a majority of the governments concerned. But there are other ways of getting results, the delegates to the FAO are extremely competent, and we can certainly count on them, in the years ahead, to do as good a job as the various national governments, to which they are responsible, will permit.

Consider, for example, the second method of increasing the food supply. When one looks at a map of the world, colored or shaded according to the density of population, one sees that large areas are almost uninhabited. They are uninhabited because, under present conditions, they are uninhabitable. In some places, the expenditure of more or less considerable quantities of human labor and capital might change the conditions and make the land productive. As world population rises and the demand for food yet further outstrips the supply, it will become increasingly worth while to spend time, work and money on tasks which, in present circumstances, are economically unjustifiable. And if atomic power can be harnessed without too much danger, and made available at a very cheap rate, many projects at present quite unjustifiable would become matters of practical policy. Meanwhile, it has been reported that the Russians have succeeded in thawing out the Siberian tundra and converting it into fields of rye and wheat. If this experiment should prove successful, much hitherto barren land in sub-arctic Asia and America might become productive.

Any increase in the world's total food supply is desirable. But it should always be remembered that, from a political point of view, the most desirable kind of increase is one which does not involve a natural monopoly by any one nation. The ideal to be aimed at is a method for increasing the food supply that shall be equally available to all nations, regardless of their size, population-density and geographical position. A step in this direction would be taken if new methods could be devised for getting a greater amount of food from the sea. At the present time, some of the seas in the immediate neighborhood of densely populated areas are perhaps being overfished, but there are large under-exploited areas. It has been found, too, that in landlocked bays and inlets the supply of fish can be increased by dropping suitable fertilizers into the water. The overgrazing and consequent erosion of pasture lands will soon compel us to turn more and more to the seas as our prime source of animal protein. The sooner we set about discovering the basic laws of marine stock-raising the better.

Some countries are far from the sea and some seas are by nature less productive than others. Even in salt water there is a natural monopoly. To break the politically dangerous monopolies in fertile territories and in access to the sea, chemists and biologists should be enlisted to collaborate on a series of Manhattan Projects, not of destruction, but of creation. Thus, the Germans are said to have used a method for

converting organic waste products, such as sawdust, into a sugar solution for the culture of edible yeasts. Such a technique, if suitably developed, might provide much-needed proteins for those millions who, at present, have to subsist on an unbalanced diet of cereals. And the goal of another of these projects would be the synthesis of chlorophyll, the substance which permits the growing plant to use the sun's energy to convert air and water into carbohydrates. Up to the present, the rulers of the world have been ready to lavish time, energy, money and brains upon the development of atomic and biological weapons; it might be a good thing to use the resources of applied science for the relief of the world's hunger and the removal of one of the principal causes of war.

Natural monopolies in raw materials are even more politically dangerous than natural monopolies in food. When located in the territory of a strong nation, deposits of minerals necessary to industry are a standing temptation to the abuse of military and economic power; when located in that of a weak nation, they are a standing temptation to aggression from abroad. Research should be deliberately organized for the purpose of discovering universally available substitutes for these relatively rare and most unevenly distributed minerals. If successful, such research would have two beneficial results; it would break the natural monopolies which are so politically dangerous; and it would help our industrial civilization to shift from its precarious basis in the exploitation of rapidly wasting assets to a more secure, a more nearly permanent foundation.

The Threat to World Peace

We now come to the problem of atomic energy. Though we would like to assume (and it would be a pretty large assumption) that henceforward atomic energy will be used exclusively to provide power for peacetime industry and agriculture, all the time the temptation to use the new source of energy for political purposes, in war or revolution, would beckon every ambitious adventurer, every fanatic and idealist. "Lead us not," we pray, "into temptation"—for the good reason that, whenever temptation is strong enough and persistent enough, we almost invariably succumb to it.

Industrial civilization is based upon the exploitation of wasting assets by means of man-power and the power generated by coal, oil, gas and falling water. If successfully harnessed, atomic energy will increase the available power to an enormous extent. From this two results may be anticipated, one unfavorable, the other favorable. To begin with, we may expect that increased power will lead to the more effective exploitation and consequently to the more rapid exhaustion of the more easily available supplies of such indispensable minerals as iron, tin, copper, zinc and the like. Atomic energy will permit us to enjoy the prosperity of the spendthrift who lives gloriously for a few years on inherited capital. If this were all that could be expected, the discovery of atomic energy would be wholly disastrous. But fortunately this is not the whole story. Given an indefinite amount of cheap power, it will become economically possible to exploit deposits whose low concentration of desirable minerals renders them, under present conditions, practically worthless. In other words, the harnessing of atomic power is likely to accelerate the dissipation of what may be called our high-grade capital; but it should postpone the final onset of bankruptcy by making available to industry the low-grade capital which it now costs us too much to spend. In combination with a reasonable population policy, a reasonable policy for the use of atomic energy might permit some better version of our industrial civilization to achieve stability and a certain permanence.

Applied science can be used in the fight for liberty, no less effectively than in the fight for peace. Let us assume, for example, that a means will be discovered for substantially increasing the supply of food. This would have the same kind of result as the discovery of a second New World. It would make life easier for the inhabitants of overcrowded countries and, by doing so, it would remove the necessity for some of the "centralized and peremptory social controls", which must always be imposed when the pressure of population upon resources become excessive.

Meanwhile, every day brings its quota of some 55,000 new human beings to a planet which, in the same period of time, has lost through erosion almost the same number of acres of productive land and goodness knows how many tons of irreplaceable minerals. Whatever may be happening to the superficial crisis, to the crisis on the political, or industrial or financial levels, that which underlies it persists and deepens. The current, almost explosive growth in world population began about two centuries ago and will continue, in all probability, for at least another 100 years. So far as we know, nothing quite like it has ever happened before. We are faced by a problem which has no earlier precedent. To discover and, having discovered, to apply the remedial measures is going to be exceedingly difficult. And the longer we delay, the greater the difficulty will be.

Science News Letter, March 26, 1949

ASTRONOMY

Total Eclipse of Moon

The first eclipse of the year will occur on the night of April 12. Saturn will be the only planet visible next month in the evening skies.

By JAMES STOKLEY

➤ THE most interesting astronomical event of April is a total eclipse of the moon, which occurs early in the night of Tuesday, April 12, and is visible throughout North America. This is the first eclipse of 1949 and one of two eclipses which occur in April, but the second will not be seen from this part of the world.

The second is a partial eclipse of the sun, which comes on April 28 and will be visible over practically all of Europe, northwestern Africa, Greenland, Iceland, Baffin Land, the North Atlantic Ocean and the Arctic regions, including the northernmost part of Siberia. Where it is at its maximum, only 60% of the solar diameter will be hidden by the moon. That is, the inner part of the lunar shadow, where the sun would be totally eclipsed, does not touch the earth at all.

The evening skies in April bring only one planet, Saturn, which stands high in the south very close to the star Regulus, in the constellation of Leo, the lion. Its position is shown on the accompanying maps, which depict the heavens as they appear about 10:00 p.m. at the beginning of the month and an hour earlier at the middle. Saturn is just twice as bright as Regulus, and shines with a steadier light. This is because of the fact that it is a planet, shining by reflected sunlight, rather than a star, as Regulus is, a distant sun emitting light itself.

In Leo is a smaller star-group called the sickle, with Regulus at the end of the handle. The blade of the sickle forms the lion's head, while Denebola, farther east and part of a little triangle of stars, is the animal's tail.

Next to Leo, to the left, is the rather long constellation of Virgo, the Virgin, in which we find the star called Spica. On the other side of the lion is Cancer, the crab, not a very conspicuous group though it is part of

the zodiac, the path through which the sun, moon and planets appear to move. But next to Cancer we come to Gemini, the twins, with the first magnitule star Pollux.

Below Gemini is Orion, the warrior, which was so conspicuous in winter evening skies, but is now about to disappear from view. Betelgeuse, in this figure, is also of the first magnitude, as is Sirius the dog-star, in Canis Major, the great dog, which stands to the left, close to the southwestern horizon. To the right of Orion can be seen all that now remains visible of Taurus, the bull, with Aldebaran as the brightest star. A little higher is Auriga, the charioteer, with Capella.

High in the east, near Virgo, is Bootes, the bear-driver, of which brilliant Arcturus is part. Extending upwards from this constellation is the very well-known "great dipper," part of Ursa Major, the great bear. The dipper is now inverted. In the bowl are the two stars known as the pointers, which show the direction of Polaris, the pole star. Winding around the eastern side of the little dipper, of which Polaris is part, we see the figure of Draco, the dragon, whose head brings us to the group of Hercules. Below this constellation Lyra, the lyre, is coming into view, but it is so low that only the star Vega is shown. By summer this group will be high overhead in the evening, and Vega will outshine all other stars that are visible.

Though Saturn is the only planet now seen during evening hours, Jupiter appears after midnight, in the constellation of Capricornus. The other naked-eye planets, Mercury, Venus and Mars, are all so nearly in the same direction as the sun in April that they are not visible.

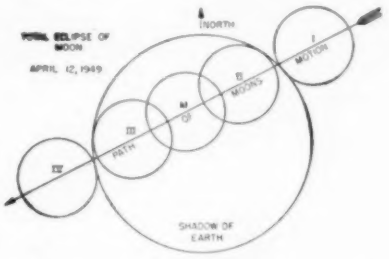
Since the earth and the moon alike have no light of their own, but are illuminated by the sun, they cast shadows in the direction away from the sun. Since they fall generally into empty space, however, the shadows are not evident until something gets into them. When the moon's shadow falls on the earth, we have an eclipse of the sun; while a lunar eclipse happens when the moon enters the earth's shadow, as it does in April.

These shadows are in two parts. There is an inner region, called the umbra, where the shadow-casting body completely obscures the sun. Around this is an outer part, called the penumbra, where the sun is only partly hidden. In the case of the eclipse of the sun on April 28, it is the penumbra that falls on the earth, while the umbra never reaches it at all.

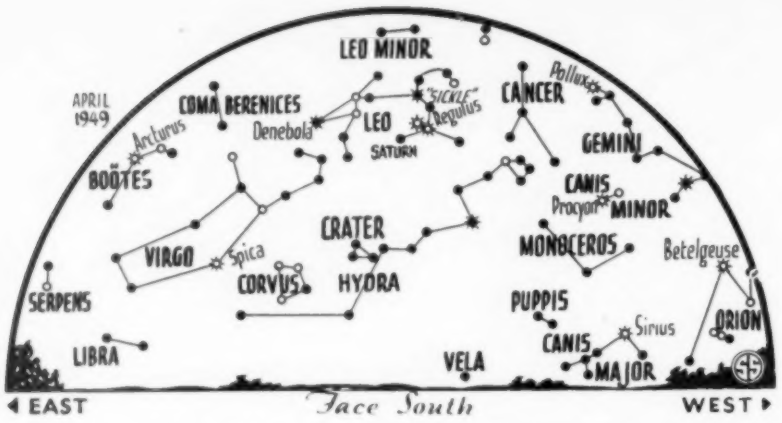
An eclipse of the sun must occur when the moon is new, for then it is in the same direction as the sun from the earth. Similarly, a lunar eclipse must occur at full moon, for only then is it in the opposite direction from the sun, and thus able to enter the earth's shadow. We do not, however, have a solar eclipse every time the moon is new and one of the moon every time it is full, because it generally passes above or below the line joining the sun and earth. Then at new moon, the lunar shadow falls into space, rather than on earth, and at full moon that body passes outside the earth's shadow. Twice every month, however, the moon is at a position called a "node," when it passes through the plane of the earth's orbit around the sun. When one of these nodes happens to come at new or full moon we have an eclipse.

On the evening of April 12, the full moon will be shining in the sky, at full brilliance, until after 8:32 p.m., EST. Then it starts to enter the penumbra of the earth's shadow, but nothing will be noticed until perhaps half an hour or so later, when the light of the moon seems somewhat dimmed. By then the earth will be cutting off a considerable part of the sun's illumination.

The accompanying diagram shows the principal phases of the eclipse proper.



At 9:28 p.m., EST, as shown at 1, the southeastern edge of the moon will make its first contact with the dark core of the shadow, represented by the large



☼ ✱ ○ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

circle. Just an hour later, at 10:28 p.m., the moon will be in the position indicated by II, and the total eclipse will begin. At 11.11 p.m., EST, the eclipse will be at its middle, as shown at M. III shows the end of the total eclipse, as the eastern edge of the moon starts to emerge from the umbra, at 11:54 p.m. Just as it took an hour to enter the umbra, it takes an hour to leave. At 12:54 a.m., EST, on April 13, the moon is in position IV, and the eclipse is over. At 1:51 a.m. the moon will be completely out of the penumbra, shining with undiminished light.

Between I and II, and between III and IV, the curved shadow of the earth will be seen creeping across the lunar disk. Even at M, when the eclipse is at its height, the moon will not be completely dark, but will shine with a coppery-red light. The reason for this is that the layer of air around the earth acts as a prism and refracts some of the sunlight into the shadow. As this light passes through the atmosphere, some of its blue rays are scattered, and these give the sky over those regions its blue color. With so much blue light removed, the rays which penetrate are predominantly red. It is a similar effect that gives the setting sun its red color, but the effect is even more pronounced with the eclipse, for then the rays have passed through twice as long a path in the atmosphere as those which reach us at sunset. Thus, it is a red light which falls on the moon during a total eclipse.

Time Table for April

April	EST	
3	5:00 p. m.	Planet Neptune directly opposite sun and nearest earth; distance 2,721,000,000 miles. (Not visible to naked eye.)
6	8:01 a. m.	Moon in first quarter
9	8:26 a. m.	Moon passes Saturn
12	4:00 a. m.	Moon nearest; distance 222,500 miles
	11:08 p. m.	Moon full and in total eclipse
19	10:15 p. m.	Moon passes Jupiter
	10:27 p. m.	Moon in last quarter
21	early a. m.	Meteors from direction of constellation of Lyra
24	5:00 p. m.	Moon farthest; distance 252,200 miles
28	3:02 a. m.	New moon, partial eclipse of sun visible in Europe and Arctic regions

Subtract one hour for CT, two hours for MT, and three for PT.

Science News Letter, March 26, 1949

INVENTION

New Device Measures Ripeness in Fruit

➤ TESTING the ripeness of fruits and vegetables has long been done by rule-of-thumb—or rather, by rule-of-thumbnail. The tester simply pressed a thumbnail against the specimen, and guessed how hard or how soft it was.

Now Dr. Edward Ross of the State College of Washington has put such testing on a mechanized, exactly measurable basis. In his testing machine a small piston, powered by a compressed gas from an ordinary commercial cyclinder, pushes a rounded brass tip five thirty-seconds of an inch in diameter to a depth of one thirty-second of an inch into the skin of the fruit. The force needed is read off directly on the dial of a gauge.

Description and diagram of Dr. Ross' device is published in the journal, SCIENCE (Feb. 25).

Science News Letter, March 26, 1949

CHEMISTRY-ASTRONOMY

New Photographic Emulsion Will Help in Study of Sun

➤ A PHOTOGRAPHIC emulsion sensitive to light far into the ultraviolet may prove useful for studying the sun from rockets sent high into our atmosphere. The emulsion was developed for identifying atoms or chemicals by analyzing their radiant energies.

Called a "vacuum ultraviolet" emulsion, the material was described to the Optical Society of America meeting in New York by Arthur L. Schoen and Edwin S. Hodge of Kodak Research Laboratories. The new emulsion has extremely close-packed silver grains with very little gelatin.

Ultraviolet rays of the sun are intense at high altitudes where the new emulsion may be used, for at this altitude these rays have not been filtered out by the earth's atmosphere. To test the emulsion here on earth, air was pumped out of a vacuum spectrograph and the emulsion, placed in the vacuum, was exposed to a high intensity spark, rich in ultraviolet radiation.

Science News Letter, March 26, 1949

Words in Science— HYDROPONICS

➤ ORIGINALLY meaning gardening in water instead of earth, hydroponics is now applied to any sort of soilless gardening whether the plants are grown in tanks of water, or in sand, gravel, vermiculite, sawdust or any other sterile material. You pronounce the word high-dro-pon-icks.

In hydroponics, fertilizer chemicals in suitable proportions are provided to the plants. From these the plants manufacture their own foods. Through hydroponics, it has been possible to grow flourishing gardens on barren volcanic islands where even the water has to be distilled from the sea, and not a grain of real soil was available.

Science News Letter, March 26, 1949

GENERAL SCIENCE

Making Aged Healthy Seen As Way to Lasting Peace

➤ BY MAKING old age healthy medical scientists can lay the foundations for lasting world peace, Dr. Edward J. Stieglitz of Washington, D. C., declared at the medical research conference on clinical problems of lasting peace held at the Smith, Kline and French Laboratories in Philadelphia.

"Longevity," he declared, "is here. We are entering an age of age."

He sees "true hope" in this, because "maturing mankind should become finer, wiser, and more tolerant. Such maturity, possible only with health into later years, may even give to the world a lasting peace."

Being healthy in older years is first of all a responsibility of the aging person himself. Doctors and medical service schemes can never give health to anyone, Dr. Stieglitz warned.

"Health, like esteem, must be earned," he said. "But it is the responsibility of medical science and practice to discover the causative factors responsible for premature depreciation and the means of their prevention, and to guide and advise those who want to stay well.

"There is much known which is not fully applied, but there is more which we need to know. Thus, scientific research into all of the many facets of health maintenance and construction is the cornerstone upon which we may hope to build a more peaceful, because more mature, world."

Science News Letter, March 26, 1949

Science Service Radio

➤ LISTEN in to a discussion on "Combatting Industrial Health Hazards" on "Adventures in Science" over the Columbia Broadcasting System at 3:15 p.m. EST, Saturday, April 2. Dr. James H. Sterner, director of Eastman Kodak Company's Industrial Medical Department and president of the American Industrial Hygiene Association, Frank A. Patty, director of the Industrial Hygiene Service of General Motors Corporation, and L. V. Taylor, supervisor of the Health and Safety Division of the American Can Company, will be guests of Watson Davis, director of Science Service. These leaders in industrial hygiene will preview the news that will come out of the meetings of medical authorities being held in Detroit for a week beginning that day. Experts will discuss the dangers of atomic radiation, how to prevent deaths from smog and industrial fumes and the new menace of beryllium poisoning that may be caused by careless breaking of fluorescent tubes.

Science News Letter, March 26, 1949

BOTANY

NATURE RAMBLINGS by Frank Thone

Lowly Evergreens

➤ "EVERGREEN," to most of us, immediately connotes tall trees like pine, spruce and fir; perhaps also, to dwellers in the warmer parts of this country, trees and shrubs with persistent broad leaves, like rhododendron, live-oak and some of the magnolias. But the woods are literally full of evergreens that are only a few inches tall; for any plant is properly classifiable as evergreen if it is just that—ever green, holding to its leaves, or at least a large part of them, instead of shedding them in autumn and growing an entire new set in spring.

Some of our loveliest woodland flowers qualify thus as evergreens—the arbutus that is in bloom right now on acid soils in Eastern woods, and the wider-ranging hepatica that will soon be unfolding its bluish-white bells. One of these lowly but lovely plants gets its name from the perennial character of its leaves: the wintergreen.

There are flowerless evergreens on the forest floor, too: most mosses, several species of fern, and those interesting spiny-leaved fern relatives known as ground-pine and club-mosses. As a matter of fact, the evergreenness of some of these is proving their undoing, for market-gatherers take merciless toll of several species of these plants, notably the ground-pine.

One thing especially noteworthy about these lesser evergreens—indeed, about evergreens generally—is the gradual darkening of the leaves as they grow older. In some species, too, there is a reddening or purpling that may even come to mask the dark green entirely. This empurplement of evergreen leaves is seen most strikingly in the last-year foliage of the hepatica. It is especially noticeable after the new leaves begin to develop, for you will find a crown of light green leaves standing up above a lower circle of the purplish old ones.

This reddening or purpling of persistent leaves seems to be a response to winter conditions—whether low temperature or exposure to slanting sunlight striking through the leafless woods is not quite certain. Botanists who have worked in the Arctic remark on the prevailing redness of all foliage there.

Science News Letter, March 26, 1949

AERONAUTICS

More Thrust Power Needed

➤ VARIOUS means for increasing the thrust of airplane jet engines for short periods have become of particular importance in increasing the effectiveness of this type of power plant, the Institute of Aeronautical Sciences was told in Cleveland by Bruce T. Lundin of the National Advisory Committee for Aeronautics.

Thrust augmentation, he called the additional power for spurts. Thrust augmentation methods are finding principal application, he said, in improving the take-off and climb characteristics of jet-propelled aircraft, as well as improving the combat and high speed performance of many military aircraft. He discussed three methods of thrust increase now in use. They are tail-pipe burning, water injection, and the air bleedoff method.

Tail-burning involves what is often called an after-burner. Exhaust gases from the regular engine pass through it, and additional combustion results which contributes to the total thrust. The successful application of tail-pipe burning, the scientists were told by Melvin S. Feder and Richard Hood, also of the Cleveland laboratory of the NACA, depends in part on the development of satisfactory control systems.

In general, they stated, control systems for all jet engines must be designed to give safe and stable engine operation over the desired thrust range. Thus, those variables which may cause engine failure must be controlled in addition to the control of variables which facilitate changes in thrust. Excessive engine speed or turbine inlet temperature cause engine failure. Therefore, for the jet engine with tail-pipe burning, engine speed and turbine inlet temperature must be controlled.

For continued operation of an airplane at speeds one and one-half that of sound, jet engine after-burning or tail-pipe burning is the only method of jet thrust increase that increases the maximum range of the plane over that obtained with a normal jet engine, Eldon W. Hall, of the same laboratory, told the meeting.

Discussing a comparison of various methods of thrust augmentation, he stated the results of studies indicate that either bleedoff or rocket assist offers the possibility of large thrust increases at the expense of high specific fuel consumption. Water injection offers simplicity and light weight.

Science News Letter, March 26, 1949

• Books of the Week •

TO SERVE YOU: To get books, send us a check or money order to cover retail price. Address Book Dept., SCIENCE NEWS LETTER, 1719 N St., N. W. Washington 6, D. C. Ask for free publications direct from issuing organizations.

THE ADVANCEMENT OF SCIENCE—*British Association for the Advancement of Science*, 365 p., paper, 6 shillings. Largely addresses delivered at Brighton meeting, 1948.

ALLERGY: What it is and What to do about it—Harry Swartz—*Rutgers University Press*, 210 p., $2.75. For millions affected by allergy, the author has written this interesting study to clarify misconceptions of this age old mystery.

ARCHITECTURAL DRAFTING—William J. Hornung *Prentice-Hall*, 154 p., illus., $4.50. This book is the development of material used at the National Technical Institute in New York. Topics discussed are: construction principles, starting house plans, heating a house, and the model house.

BIOCHEMICAL PREPARATIONS, Volume I—Herbert E. Carter, Ed.—*John Wiley*, 76 p., illus., $2.50. The first of a "preparations" series. A reliable source on procedures for the preparation of compounds of biological interest. This study is to the biochemist what *Organic Syntheses* is to the organic chemist.

THE CHEMISTRY AND PHYSIOLOGY OF GROWTH—Arthur K. Parpart, Ed.—*Princeton University Press*, 293 p., $4.50. Ten leaders of research in the field of growth, including cancer research, report their findings and point out what needs to be done in the future.

CHILDREN DISCOVER ARITHMETIC: An introduction to structural arithmetic—Catherine Stern—*Harper*, 295 p., illus., $4.50. This interesting discussion presents an approach to the teaching of arithmetic based on insight into structural relations which all students of social science would appreciate. Psychologists will find experimental proof of the validity of the Gestalt principles. Teachers will find it helpful for it presents a method whereby the child obtains mathematical concepts which will not have to be discarded as he goes on to more advanced work.

THE COMING AGE OF WOOD—Egon Glesinger—*Simon and Schuster*, 279 p., illus., $3.50. FAO's chief of the Forest Products Branch tells how the forest can contribute toward the feeding, clothing and housing of the world's needy.

COMPARATIVE ANATOMY: An introduction to the vertebrates—Leverett A. Adams and Samuel Eddy—*John Wiley*, 520 p., illus., $5.00. This book replaces the *Introduction to the Vertebrates* written in 1933 and revised in 1938 by the senior author. It is now usable for a much wider variety of vertebrate courses. New discoveries and viewpoints included.

DICTIONARY OF GUIDED MISSILE TERMS—*Public Affairs Press*, 57 p., $1.00. (Cloth $2.00.)

ECUADOR AND THE GALAPAGOS ISLANDS—Victor Wolfgang von Hagen—*University of Oklahoma*, 290 p., illus., $3.75. An informal history and picturesque narrative of a republic where it is necessary "to take two steps in order to take one forward." Well illustrated.

FLUID MECHANICS—R. C. Binder—*Prentice-Hall*, 361 p., illus., $5.65. Introduction to the fundamentals of fluid mechanics. A well balanced, practically treated study.

JAHRBUCH DER OESTERREICHISCHEN WISSENSCHAFT, I. JAHRGANG, 1947-48—R. Meister, Ed.—*Oesterreichischer Bundesverlag fur Unterricht, Wissenschaft und Kunst*, Vienna, (U. S. Distributors: Stecht-Hafner) 352 p., $3.50. A new listing of scientific institutions and personnel in Austria, undertaking to do for one fragment of the shattered academic world what prewar *Minerva* used to do for the whole.

MICROBIOLOGY AND MAN—Jorgen Birkeland—*Appleton-Century-Crofts*, 525 p., illus., $5.00. An account of the diverse properties of microorganisms and a description of the tools and techniques for their handling.

ROCKET PROPULSION ELEMENTS: An introduction to the engineering of rockets—George P. Sutton—*Wiley*, 294 p., illus., $4.50. An analysis of the basic elements and the technical problems of rocket propulsion including descriptions of physical mechanisms and designs of rocket propulsion systems.

SOME ASPECTS OF HOSTILITY IN YOUNG CHILDREN—Anneliese Friedsam Korner—*Grune & Stratton*, 194 p., $3.50. A study which scrutinizes and examines the feelings of hostility which small children have toward their parents and parent substitutes.

TRIAL AND ERROR: The autobiography of Chaim Weizmann—*Harpers*, 493 p., illus., $5.00. Written with deep sincerity and candor, this is the personal story of a gifted scientist of international reputation and a world leader in democratic principles. For the layman and the scientist.

Science News Letter, March 26, 1949

• New Machines and Gadgets •

If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, 1719 N St., Washington 6, D. C. and ask for Gadget Bulletin 458. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

⚙ *EYEGLASS case is made of a clear transparent plastic which is strong enough to protect its contents under any ordinary conditions. The case is made of two pieces, hinged on one long side.*

Science News Letter, March 26, 1949

⚙ *LEMON SORTER utilizes an electric eye to size and shape the fruit at a rate of 240 per minute. The lemons drop from a moving belt through an opening to cut the beam from the photocell. One of five doors is opened by the electronic device, depending upon the size of the shadow cast by each lemon.*

Science News Letter, March 26, 1949

⚙ *TYPEWRITER RIBBON makes possible perfectly typed letters but typing errors can be completely eradicated with the use of a liquid made for the purpose. A treatment lasting only a second or two leaves the paper clear without smudge, and there is nothing to drop into the machine as when an eraser is used.*

Science News Letter, March 26, 1949

⚙ *FLOWER-POT container, shown in the picture, is made of a decorative, water-resisting plastic, and is designed to hold water to reach the plant by absorption. The plastic form is rigid enough to resist warping, and*

it is also resistant to grease and oils, and may be easily cleaned.

Science News Letter, March 26, 1949

⚙ *CLOTHING ROD, for an automobile, is designed to fit across the space in the rear of the car with its ends attached above the rear doors. It can be installed in five seconds without the use of tools by a simple screw adjustment, with a left-hand thread on one end and a right-hand thread on the other.*

Science News Letter, March 26, 1949

⚙ *COMBINATION HAMMER or drill, electrically operated, is small enough to be used in hard-to-get-at places, light enough to hold at arm's length but powerful enough to hit heavy blows or to drill holes quickly in brick, cement and stone. The drill rotates in action so that it will cut perfectly rounded holes.*

Science News Letter, March 26, 1949

⚙ *MOTION PICTURE and sound machine, small and light enough to be carried in a luggage-type case, permits a salesman to present the story of his product in any office with an ordinary electric outlet. It uses 16-millimeter film, and has a film magazine that eliminates the need for rewinding after each use.*

Science News Letter, March 26, 1949

⚙ *MOTH PROTECTION in the clothes closet is obtained with a device that consists of a protective pad, wire hanger, and a chemical housed in a plastic case. The killer chemical used is paradichlorobenzene, which is heavier than air and will travel downward to penetrate all clothing in the closet.*

Science News Letter, March 26, 1949

• Do You Know? •

Fluorescent lamps were commercially introduced just 10 years ago.

Soil type is a dominant factor in the quality of the *tobacco* grown.

Aldehydes, alcohols, acids and phenols are among substances identified as constituents in *coffee aroma.*

The roasting of *coffee beans* is the equivalent of the dry destructive distillation of a woody material; new compounds are produced in the process.

Siamese twins among fishes are not exceptionally rare; these twin fishes joined together seldom live more than a few weeks.

Twenty-nine men have lost their lives during the past 50 years in trying to reach the top of *Nanga Parbat,* an ice-sheathed, isolated, five-mile-high mountain in northwestern India.

Filbert nuts yield a nutritious salad and cooking oil.

Over 1,500,000 *G.I. loans* have been made by the U. S. Veterans Administration.

Sodium chlorite has been used for several years as a stripping agent to remove dye from textiles.

There are 1,212 *vessels* in the privately-owned American ocean-going fleet, of which nearly 500 are tankers, employed principally in the oil industry.

Wisconsin has a fee of 25 cents every four years for a *license to drive* an automobile, while in Connecticut and New Jersey the fee is $3 a year.

Tartary buckwheat, often called duck wheat or rye buckwheat, contains larger amounts of *rutin* than other varieties; this drug is widely used in testing high blood pressure cases.

Wool and hosiery are the principal export products of the *Shetland Islands.*

The 300 *wood-pressing plants* in the United States are saving the country at least 11,000,000 board feet of lumber a day; wood properly treated with tested chemicals has a service life some four times as great as otherwise.